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Chronological Evaluation of Acute Traumatic Intracerebral Haematoma

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Summary

Serial computed tomographic (CT) studies were performed in 48 patients with brain contusion. Traumatic intracerebral haematoma (TIH) had developed within 6 hours in 56% of the cases, within 12 hours in 81% and 100% within 24 hours from the onset. TIH reached its maximal size in 84% of the cases within 12 hours. The incidence of the appearance of TIH from brain contusion was 52%. The performance of frequent CT examination within 24 hours following head injury would help to lower the mortality rate of such trauma.

Keywords: Traumatic intracerebral haematoma; brain contusion; computed tomography.

Introduction

In spite of several computed tomographic (CT) studies on the time course of the appearance of traumatic intracerebral haematoma (TIH) in patients with brain contusion[1–5], little is known about its developmental process largely due to the long intervals between follow-up CT examinations.

We examined the development of TIH after the onset of head injury and the time span required for the haematoma to reach its maximum size. We also examined the incidence of the formation of TIH 3 cm in diameter resulting from brain contusion. This diameter was selected because in our clinical experience there is no indication for evacuation of TIH less 3 cm in diameter.

Materials and Methods

Thirteen-hundred and twenty-eight patients with head injury were admitted to our department between 1981 and 1985. Excluding those with acute epidural haematoma, a total of 212 patients had intracranial lesions demonstrated by CT scan: 111 cases of intracerebral haemorrhage, 43 cases of acute subdural haematoma, 39 cases of traumatic subarachnoid haemorrhage and 19 cases of acute brain swelling.

Of the 111 cases of traumatic intracerebral haemorrhage (Table I), the size of the haemorrhage was less than 3 cm in 53 cases which were excluded from this study. Ten more cases were excluded because the initial CT scan was taken more than 6 hours after the injury and the diameter of the haematoma was already over 3 cm at that time. All of these 10 patients had been observed in another hospital without CT scan and were transferred to our hospital because of clinical deterioration. The initial CT scan taken on admission showed TIH and all the patients underwent surgery immediately. In the other 48 cases, the initial CT scan was taken within 6 hours and TIH developed over 3 cm in diameter.

Results

The initial CT scan was taken between 0.5 to 6 hours (mean 1.8 hours) from the onset of head injury in 48 cases that are evaluated in this paper. CT scans were taken 2.9 times on average within 24 hours from the initial head injury because of change in the neurological state.

In 14 of the 48 cases of TIH (cases 1 to 14), the initial CT scan already revealed a TIH over 3 cm in diameter. In 6 cases (cases 15 to 20), there were no haemorrhagic findings on the initial CT scan. A salt and pepper appearance was observed in 18 cases (cases 21 to 38). In the other 10 cases (cases 39 to 48), only a small intracerebral haematoma was found on the initial CT scan (Fig. 1).

Appearance of TIH over 3 cm in diameter

Among the 48 patients, TIH over 3 cm in diameter was observed within 6 hours in 27 (56%), within 12 hours in 39 (81%) and in all 48 within 24 hours. In our series, no TIH over 3 cm in diameter developed more than 24 hours after the head injury.

Table 1. *Classification of Traumatic Intracerebral Haemorrhage*

Findings of the Initial CT	Findings of the Follow-up CT	No. of Cases
Variable	haematoma (<3 cm)	53
haematoma (>3 cm)	haematoma (>3 cm)	24
Initial CT was done		14*
within 6 hours after head injury		10**
later than 6 hours after head injury		
no finding	haematoma (>3 cm)	6*
salt and pepper	haematoma (>3 cm)	18*
small haematoma	haematoma (>3 cm)	10*
Total		111 *: 48 *: and **: 58

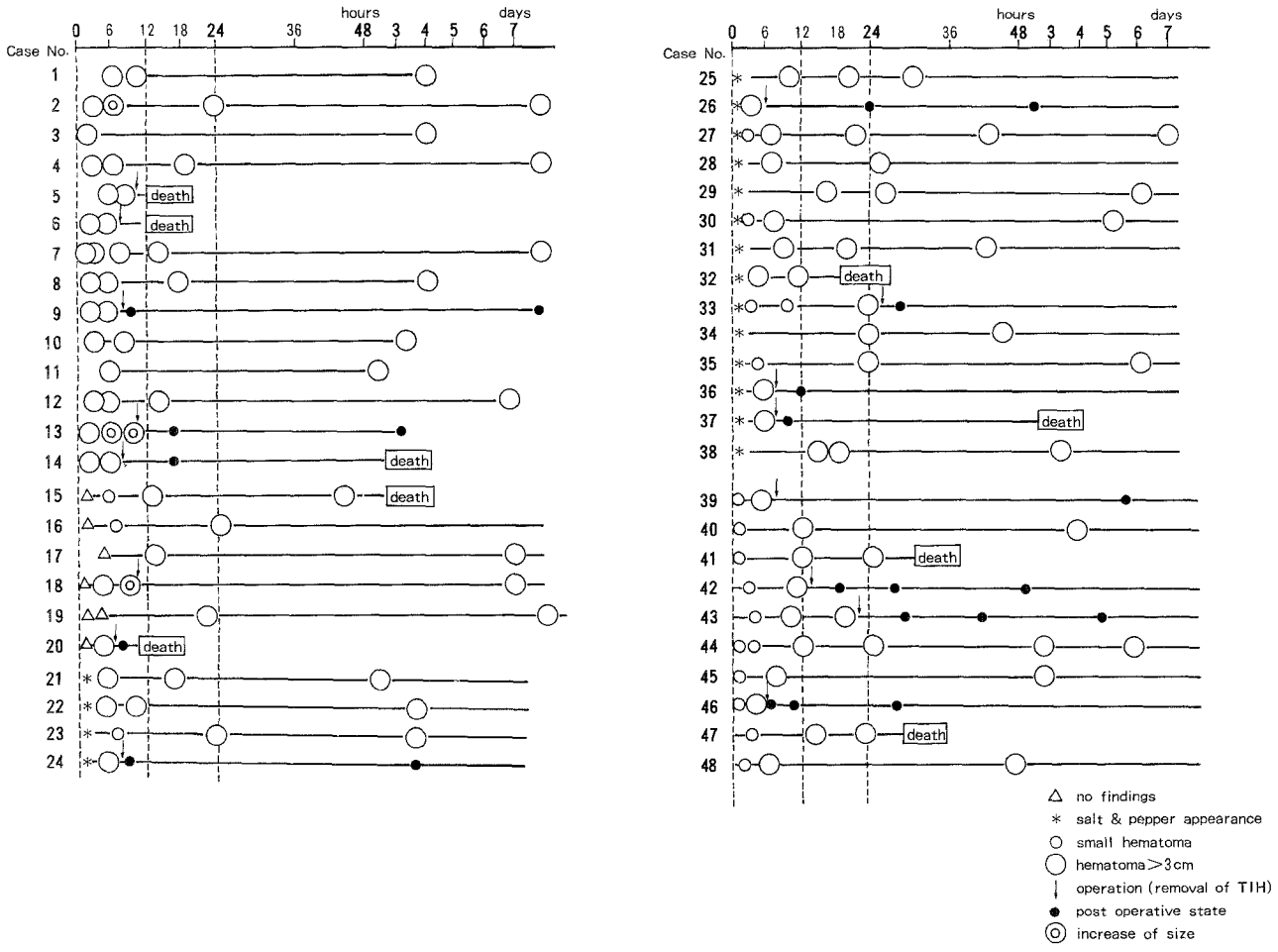

Fig. 1. Time course of traumatic intracerebral haematomas

Time of maximal TIH

To clarify the natural course of TIH, 16 cases operated upon were excluded from the evaluation. In the remaining 32 cases, TIH reached its maximal size within 6 hours after the initial head injury in 18 (56%) and within 12 hours in 27 (84%). There were no cases in which the size of TIH increased further 24 hours after the head injury.

Table 2. *Outcome of Patients with TIH over 3 cm in Diameter*

	Good recovery	Moderate disability	Severe disability	Vegetative state	Dead	Total
All cases	31 (53%)	8 (14%)	1 (2%)	2 (3%)	16 (28%)	58
Surgical cases	9 (35%)	2 (8%)	1 (4%)	2 (7%)	12 (46%)	26

Table 3. *Mortality Rate for TIH over 3 cm in Diameter*

non-operated cases	4/32 (13%)	
operated cases	12/26 (46%)	
(1) admitted immediately after head injury		5/16 (31%)
(2) admitted more than 6 hours after head injury		7/10 (70%)
Total	16/58 (28%)	

The incidence of TIH over 3 cm in diameter and outcome

The incidence of TIH over 3 cm in diameter was 52% (58/111).

Table 2 shows the outcome of all of the patients with TIH over 3 cm in diameter. Besides the 48 patients described above, 10 patients in whom the initial CT scan was taken more than 6 hours were included in this table because they also had a TIH over 3 cm in diameter and had been operated on. The haematoma was evacuated in 26 of the 58 patients with TIH.

Table 3 shows the mortality rate according to whether or not surgery was performed, and to the time of admittance. In non-operated patients, it was 13%, compared to 46% in operated patients. Among the operated patients, the mortality rate was particularly high, 70% in those admitted to our hospital more than 6 hours after head injury.

Discussion

We noted a rather high incidence (52%) of TIH over 3 cm in diameter, which demonstrates the necessity of follow-up CT studies for patients with brain contusion. From our experience, we think there are two mechanisms involved in the formation of TIH. One type of TIH occurs shortly after head injuries. In this type, the cause of bleeding is thought to be active haemorrhage from cortical or subcortical vessels and the haematoma reaches its maximal size within 6 hours (Fig. 2). We encountered a case in which active haemorrhage from the cortical artery was seen when the haematoma was removed 1.5 hours after the initial head injury. The other type was TIH forming as the result of multiple small contusional haemorrhages and TIH occurs later than those in the former type (Fig. 3).

The indication for evacuation of the TIH is sometimes difficult. In some cases, in spite of the presence of a large TIH on CT, no remarkable neurological deficit is seen. The case demonstrated in Fig. 3 is a peculiar one (Case No. 44). The Glasgow Coma Scale (GCS) score of this 66 year old man was 14 one hour after the accident (Fig. 3 A). In spite of an increasing TIH demonstrated by CT taken 12 hours after the accident (Fig. 3 C) his GCS score was 13 and conservative treatment was carried out. He was discharged about 2 months later with only right homonymous hemianopsia. On the other hand, in other cases, TIH is a partial finding of the diffuse brain injury. In these cases, their neurological condition is extremely poor from the onset and TIH is not a main cause of the poor

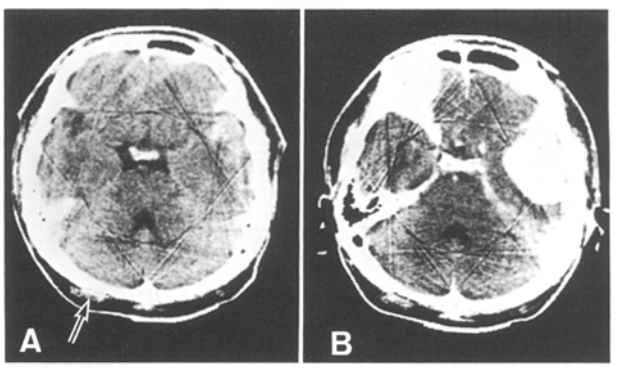

Fig. 2. Typical case of rapidly growing TIH (Case No. 26). A) CT taken about 30 minutes after the motorbike accident shows the small haemorrhagic lesion (salt and pepper appearance) in left temporal lobe. It also shows the scalp haematoma in right occipital region (arrow). B) CT taken about 2 hours after the accident shows large TIH

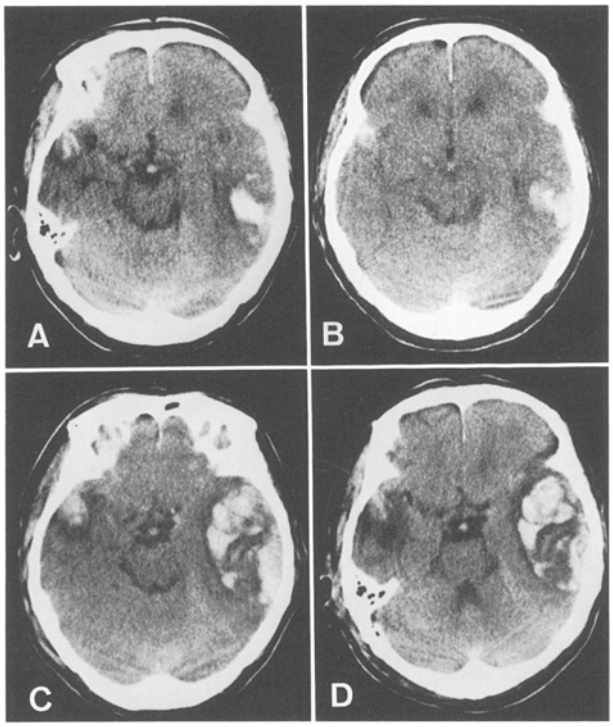

Fig. 3. Typical case of gradually growing TIH (Case No. 44). A) CT taken about 1 hour after the fall from 3 m in height shows small haematomas in bilateral temporal lobes. B) CT taken 4 hours after the accident shows almost the same findings as the previous CT. C) CT taken 12 hours after the accident shows the large TIH in the left temporal region. D) CT taken 24 hours after the accident shows the same findings as the previous CT

neurological state. We do not operate on such cases (Case No. 15, 32, 41, 47). Our indications for operation in cases of TIH are as follows:

1) The cause of the poor neurological state is thought to be TIH; 2) Haematoma is over 3 cm in diameter; 3) Progressive deterioration of the neurological signs (impaired consciousness, motor weakness, aphasia); 4) Signs of transtentorial herniation; and 5) TIH with opened scalp and skull injury.

In our series, the overall mortality rate for patients who had a TIH over 3 cm in diameter was 28%, but 46% in the surgical cases (Table 2). Thus, the outcome of the surgical cases appears extremely poor. However, this results from too late referral of patients from other hospitals. The mortality rate of the surgical patients admitted to our hospital immediately after head injury was 31% (5/16). On the other hand, in the 12 who died after surgery, 7 were admitted to our hospital from other hospitals more than 6 hours after head injury because of the clinical deterioration. The mortality rate of this group was 70% (7/10) (Table 3). Therefore, if the cases in the latter group had been diagnosed and operated on much earlier, the mortality rate would have been lower.

Our results showed TIH grows usually within 24 hours from the time of trauma. Therefore, the importance of frequent general and neurological examination and timely CT examination for patients with severe head injuries should be stressed.

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